

CLAAS



XERION 3300

Technical Systems Hydraulic System

SERVICE & PARTS

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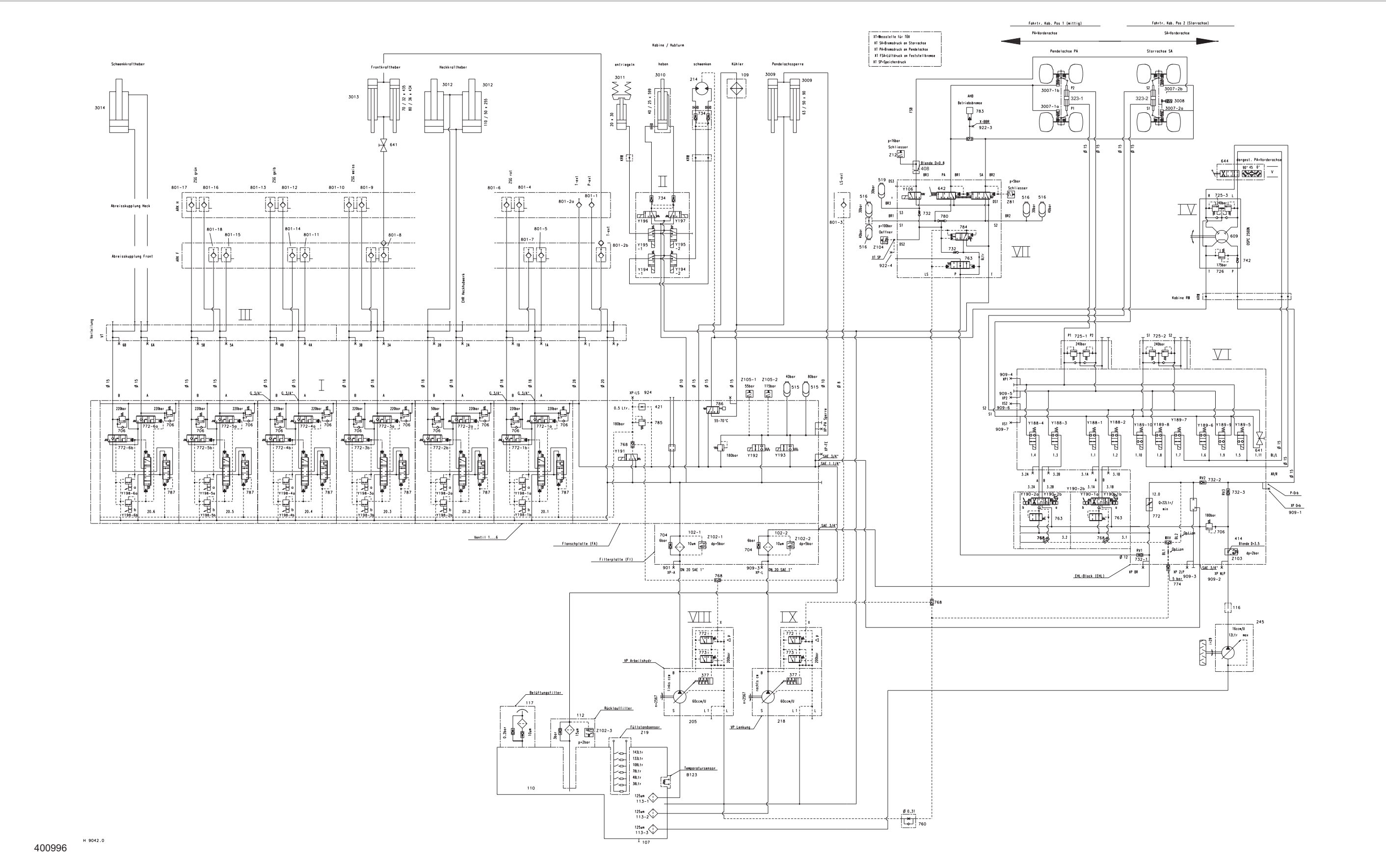
3 Working hydraulics

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1 Overall hydraulic system

Overall circuit diagram

Circuit diagram



Overall circuit diagram

Key to diagram

Item	Component
I	Main valve block
II	Cab valve block
III	Distributor block
IV	Orbitrol steering valve
V	Steering sense valve
VI	EHL valve block – Electro-hydraulic steering
VII	Main brake valve
VIII	Working hydraulics variable-displacement pump
IX	Steering hydraulics variable-displacement pump
-	-
102-1	Working hydraulics pressure filter
102-2	Steering hydraulics pressure filter
107	Oil drain
109	Hydraulic system oil cooler
110	Oil tank
112	Return filter
113-1	Working hydraulics suction filter
113-2	Steering hydraulics suction filter
113-3	Emergency steering suction filter
116	Resonance tube (Silencer)
117	Fresh air filter element
-	-
205	Working hydraulics pump
214	Hydraulic motor
218	Steering hydraulics pump
245	Emergency steering pump
-	-
323-1	Floating axle steering hydraulic cylinder
323-2	Rigid axle steering hydraulic cylinder
377	Variable-displacement pump hydraulic cylinder
3007-1a	Service brake hydraulic cylinder
3007-1b	Service brake hydraulic cylinder
3007-2a	Service brake hydraulic cylinder

Item	Component
3007-2b	Service brake hydraulic cylinder
3008	Parking brake hydraulic cylinder
3009	Floating axle lock hydraulic cylinder
3010	Cab raise/lower hydraulic cylinder
3011	Unlock cab hydraulic cylinder
3012	Rear power lift hydraulic cylinder
3013	Front power lift hydraulic cylinder
3014	Swing lower link hydraulic cylinder
-	-
406	Orifice plate F (Ø 0.8 mm)
414	Orifice plate F (Ø 3.5 mm)
421	Restrictor
-	-
515	Pressure accumulator
516	Service brake pressure accumulator
519	Parking brake pressure accumulator
-	-
609	Orbitrol steering system rotary valve
641	Shut-off valve
642	Service brake valve
644	Steering sense valve
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
725-1	Floating axle steering double shock valve
725-2	Fixed axle steering double shock valve
725-3	Orbitrol steering double shock valve
726	Steering pressure relief valve
732	Non-return valve
734	Lock-up valve unit (non-return valve)
742	Steering safety valve
760	One-way restrictor valve, one-sided
763	Input pressure balance
768	LS signal shuttle valve
772	Volume flow controller
772-1a	Volume flow controller (red A)

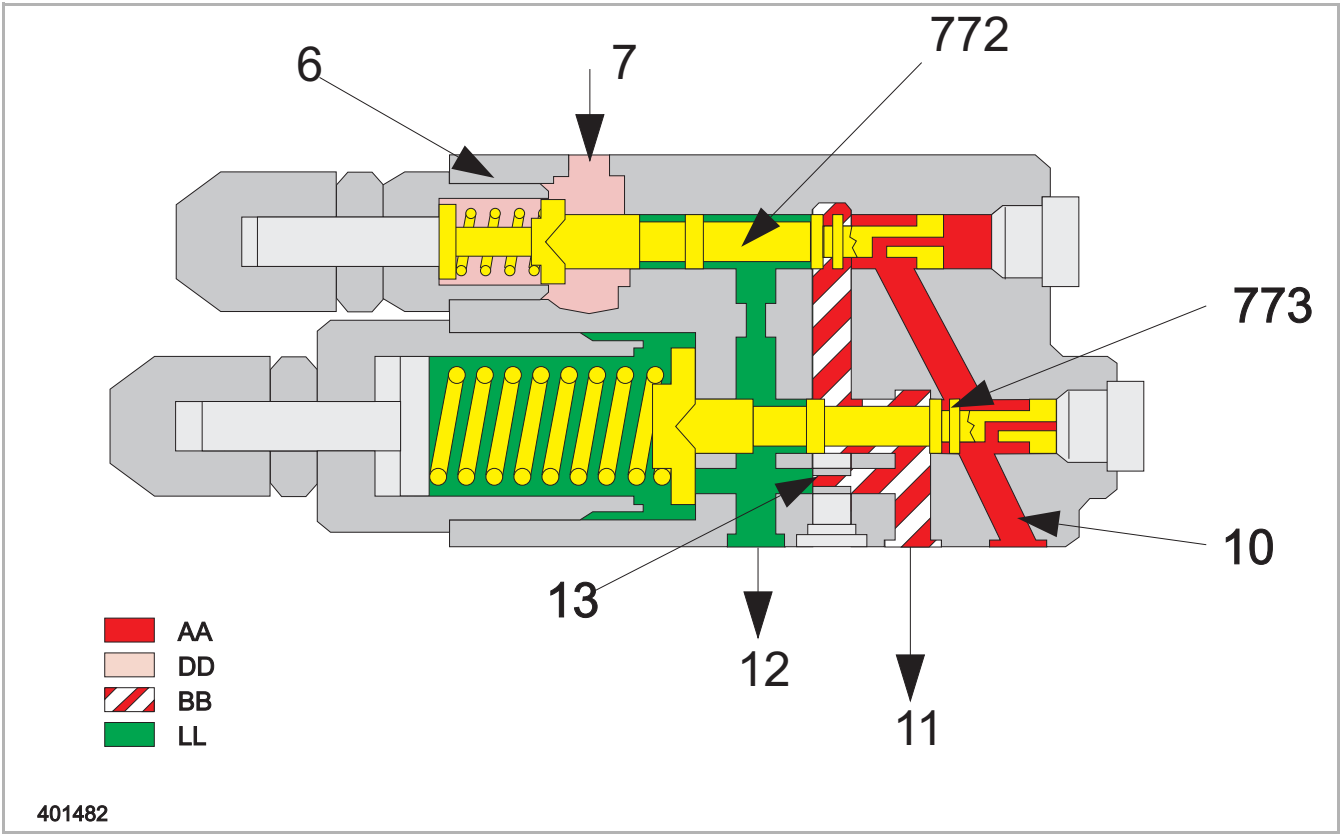
Item	Component
772-1b	Volume flow controller (red B)
772-2a	Volume flow controller (EHR A)
772-2b	Volume flow controller (EHR B)
772-3a	Volume flow controller (white A)
772-3b	Volume flow controller (white B)
772-4a	Volume flow controller (yellow A)
772-4b	Volume flow controller (yellow B)
772-5a	Volume flow controller (green A)
772-5b	Volume flow controller (green B)
772-6a	Volume flow controller (swing lower link A)
772-6b	Volume flow controller (swing lower link B)
773	Pressure controller
774	Pressurizing valve
780	Shuttle valve
783	Trailer brake valve
784	Accumulator charge valve
785	LS pressure relief valve
786	Thermostat valve
787	Pressure balance
-	-
801-1	Quick-release coupling (P power beyond)
801-2a	Quick-release coupling (T power beyond rear)
801-2b	Quick-release coupling (T front)
801-3	Quick-release coupling (LS power beyond)
801-4	Quick-release coupling (red A rear)
801-5	Quick-release coupling (red A front)
801-6	Quick-release coupling (red B rear)
801-7	Quick-release coupling (red B front)
801-8	Quick-release coupling (white A front)
801-9	Quick-release coupling (white A rear)
801-10	Quick-release coupling (white B rear)
801-11	Quick-release coupling (yellow A front)
801-12	Quick-release coupling (yellow A rear)
801-13	Quick-release coupling (yellow B rear)
801-14	Quick-release coupling (yellow B front)
801-15	Quick-release coupling (green A front)

Item	Component
801-16	Quick-release coupling (green A rear)
801-17	Quick-release coupling (green B rear)
801-18	Quick-release coupling (green B front)
-	-
B123	Hydraulic oil temperature
-	-
Y106	Parking brake solenoid valve
Y188-1	Steering logics shut-off valve solenoid valve
Y188-2	Steering logics shut-off valve solenoid valve
Y188-3	Steering logics shut-off valve solenoid valve
Y188-4	Steering logics shut-off valve solenoid valve
Y189-5	Steering logics definition valve solenoid valve
Y189-6	Steering logics definition valve solenoid valve
Y189-7	Steering logics definition valve solenoid valve
Y189-8	Steering logics definition valve solenoid valve
Y189-9	Steering logics definition valve solenoid valve
Y189-10	Steering logics definition valve solenoid valve
Y190-1a	Automatic steering solenoid valve
Y190-1b	Automatic steering solenoid valve
Y190-2a	Automatic steering solenoid valve
Y190-2b	Automatic steering solenoid valve
Y191	Constant-pressure system solenoid valve
Y192	Floating axle locking solenoid valve
Y193	Floating axle unlocking solenoid valve
Y194-1	Cab rotation solenoid valve ?
Y194-2	Cab rotation solenoid valve ?
Y195-1	Unlock cab solenoid valve
Y195-2	Unlock cab solenoid valve (not used)
Y196	Cab raise solenoid valve
Y197	Cab lower solenoid valve
Y198-1a	Pilot valve solenoid valve (red A)
Y198-1b	Pilot valve solenoid valve (red B)
Y198-2a	Pilot valve solenoid valve (EHR A)
Y198-2b	Pilot valve solenoid valve (EHR B)
Y198-3a	Pilot valve solenoid valve (white A)
Y198-3b	Pilot valve solenoid valve (white B)

Item	Component
Y198-4a	Pilot valve solenoid valve (yellow A)
Y198-4b	Pilot valve solenoid valve (yellow B)
Y198-5a	Pilot valve solenoid valve (green A)
Y198-5b	Pilot valve solenoid valve (green B)
Y198-6a	Pilot valve solenoid valve (swing lower link A)
Y198-6b	Pilot valve solenoid valve (swing lower link B)
-	-
Z12	Parking brake actual value switch
Z19	Hydraulic oil level (min.) actual value switch
Z81	Service brake pressure actual value switch
Z102-1	Working hydraulics filter bypass actual value switch (bypass open)
Z102-2	Steering hydraulics filter bypass actual value switch (bypass open)
Z102-3	Return line filter bypass actual value switch (bypass open)
Z103	Pump function actual value switch
Z104	Brake accumulator pressure actual value switch
Z105-1	Floating axle lock 55 bar pressure
Z105-2	Floating axle lock 115 bar pressure
Z12	Parking brake actual value switch
Z19	Hydraulic oil level (min.) actual value switch
Z81	Service brake pressure actual value switch
Z102-1	Working hydraulics filter bypass actual value switch (bypass open)
Z102-2	Steering hydraulics filter bypass actual value switch (bypass open)
Z102-3	Return line filter bypass actual value switch (bypass open)
Z103	Pump function actual value switch (emergency steering pump)

PFC pump

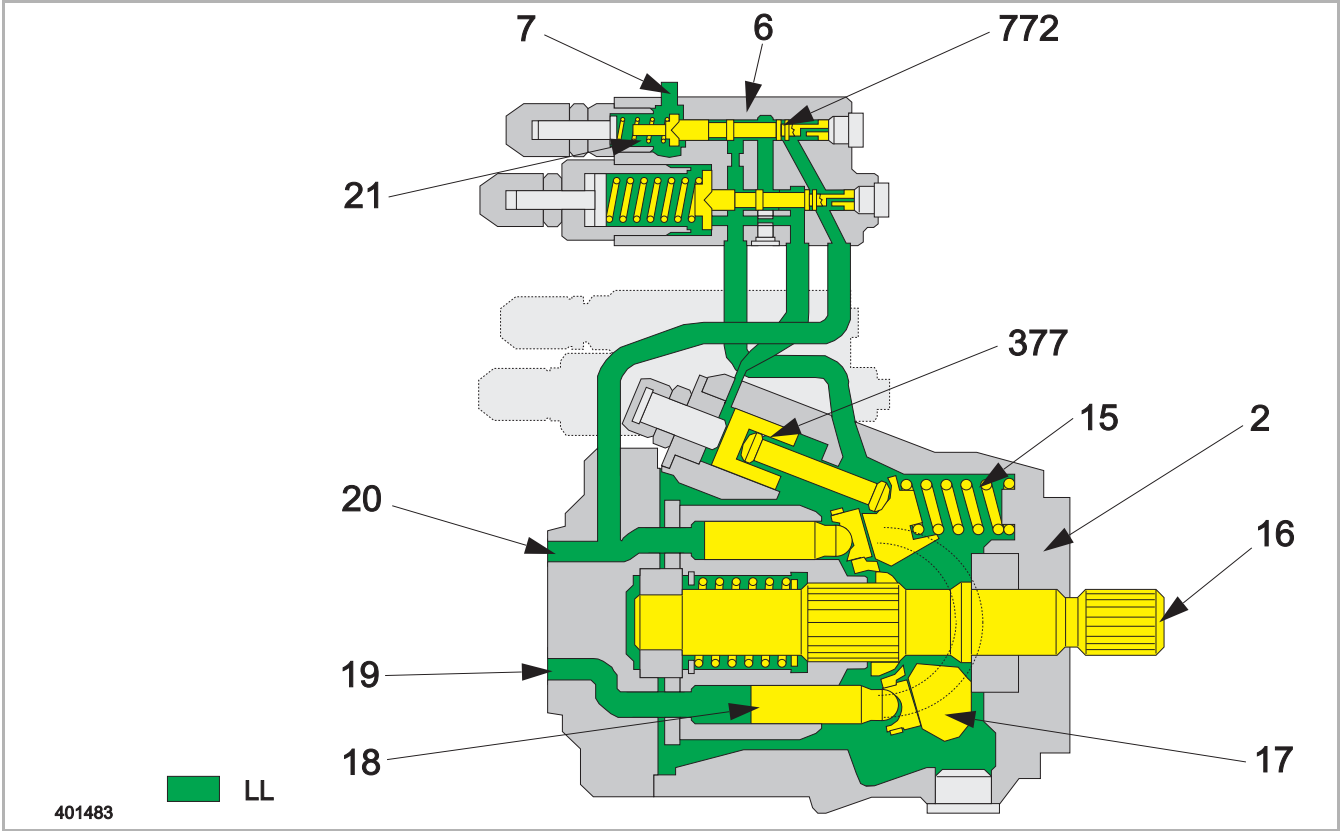
Compensating valve



Item	Component
6	Compensating valve
7	Input (load pressure from signal network)
10	Working hydraulics pump port
11	Port of control piston of working hydraulics pump
12	Tank port
13	Restrictor
772	Volume flow controller
773	Pressure controller
-	-
AA	Oil supply
BB	Pressure-reduced oil
DD	Control oil
LL	Tank (pressureless)

Description of function	The PFC pump (2) is an axial piston pump. PFC means: – P (Pressure) – F (Flow) – C (Controlled)
PFC pump	The compression spring of the volume flow controller (772) is designed so that the pump pressure acting on the face end is always 20 bar above the load pressure acting via port (7). This pressure of 20 bar is referred to as "Margin pressure". The pressure controller (773) limits the pressure in the working hydraulics circuit to 200±5 bar (Pressure relief valve function).

Initial position (engine OFF)

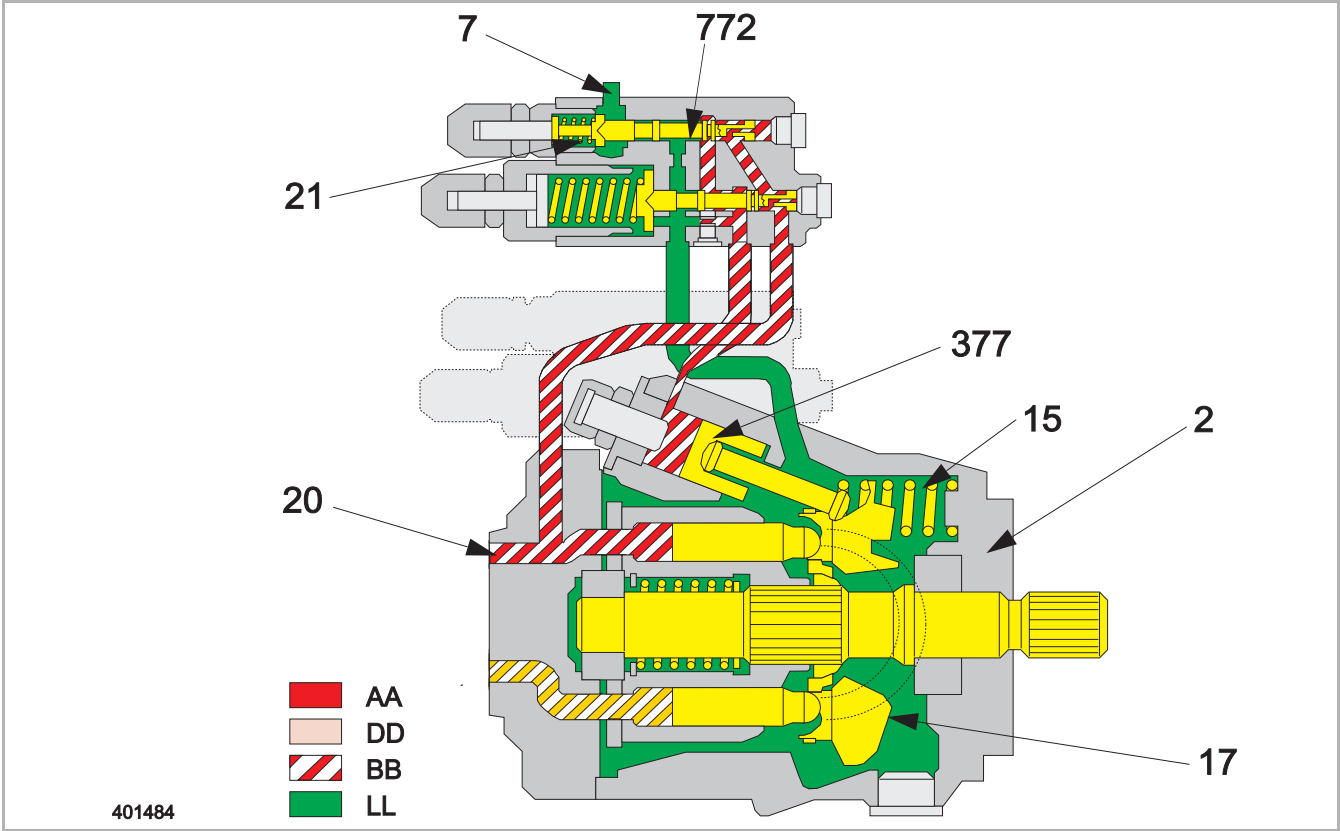


Item	Component
2	(PFC) Pump
6	Compensating valve
7	Input (load pressure from signal network)
14	Control piston
15	Control spring
16	Pump drive
17	Swash plate
18	Ram
19	Pump inlet
20	Pump outlet
21	Compression spring (margin pressure)
377	Hydraulic cylinder variable-displacement pump
772	Volume flow controller

Initial position

Since the engine has been shut down, there is no pressure in the hydraulic system. The compression spring (21) has pushed the volume flow controller (772) to the right. In this position, the top side of the variable-displacement pump hydraulic cylinder (377) is connected with the tank via the volume flow controller (772). The control spring (15) has swivelled the swash plate (17) to its maximum position.

Low-pressure standby



Item	Component
2	(PFC) Pump
6	Compensating valve
7	Input (load pressure from signal network)
14	Control piston
15	Control spring
17	Swash plate
20	Pump outlet
21	Compression spring (margin pressure)
25	Control edge
377	Hydraulic cylinder variable-displacement pump
772	Volume flow controller
-	-
AA	Oil supply
BB	Pressure-reduced oil
DD	Control oil
LL	Tank (pressureless)

Description of function

All control units are in their neutral position. At the beginning of this example, the swash plate (17) is in its maximum end position (see also Engine OFF).

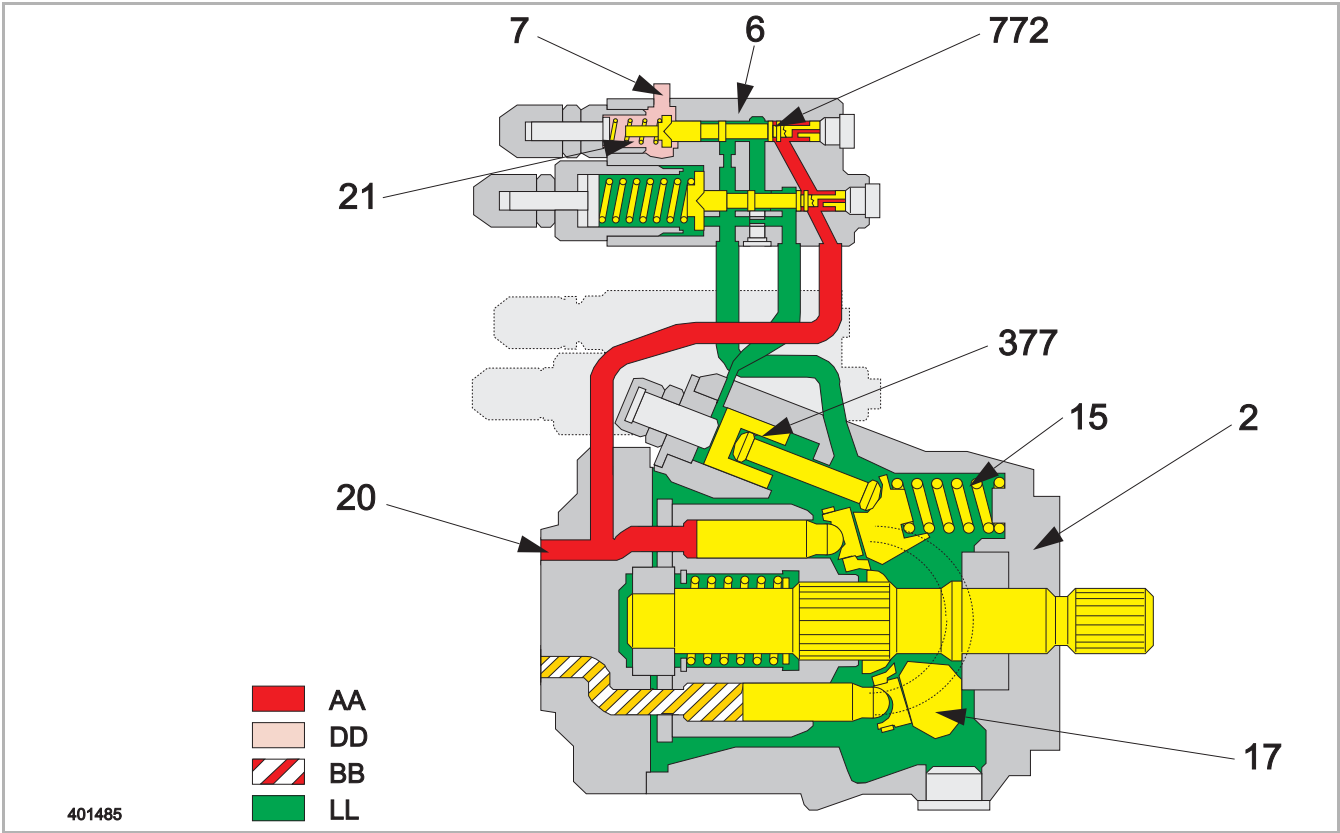
When the engine is started, the pump feeds the maximum volume flow via the pump output (20) up to the spools of all control units.

Since the spools block the flow completely, the pressure rises and is applied to the right face end of the volume flow controller (772) which is moved to the left against the compression spring (margin pressure) (21). In this process, the control edge (25) is opened so that the pressure gains access to the top side of the variable-displacement pump hydraulic cylinder (377). Now the swash plate (17) is moved to the "Minimum volume flow" position against the control spring (15). This process takes only 10 milliseconds.

In this pump position, the following happens: Volume flow is generated only to such an extent that leakage losses are compensated. The pressure required for initial actuation of a consumer is maintained.

When all control units are set to their neutral positions, the load pressure input (7) is pressureless. To move the volume flow controller (772), the pump pressure must overcome the compression spring (margin pressure) (21) and the LS residual pressure. The pressure required for this is $20 + X$ bar and is referred to as "Low-pressure standby". The "Low-pressure standby" is slightly higher than the "Margin pressure" of 20 bar. As a function of the setting of the volume flow controller (772) and of the pump leakage, "Low-pressure standby" and "Margin pressure" may be almost identical. However, the "Margin pressure" can never be higher. The low-pressure standby cannot be adjusted and may therefore vary from machine to machine. It changes as the leakage rate in the pump or in the system rises. The pump remains in the "Low-pressure standby" position until a control unit is actuated. In this operating position, the pump only requires little drive energy.

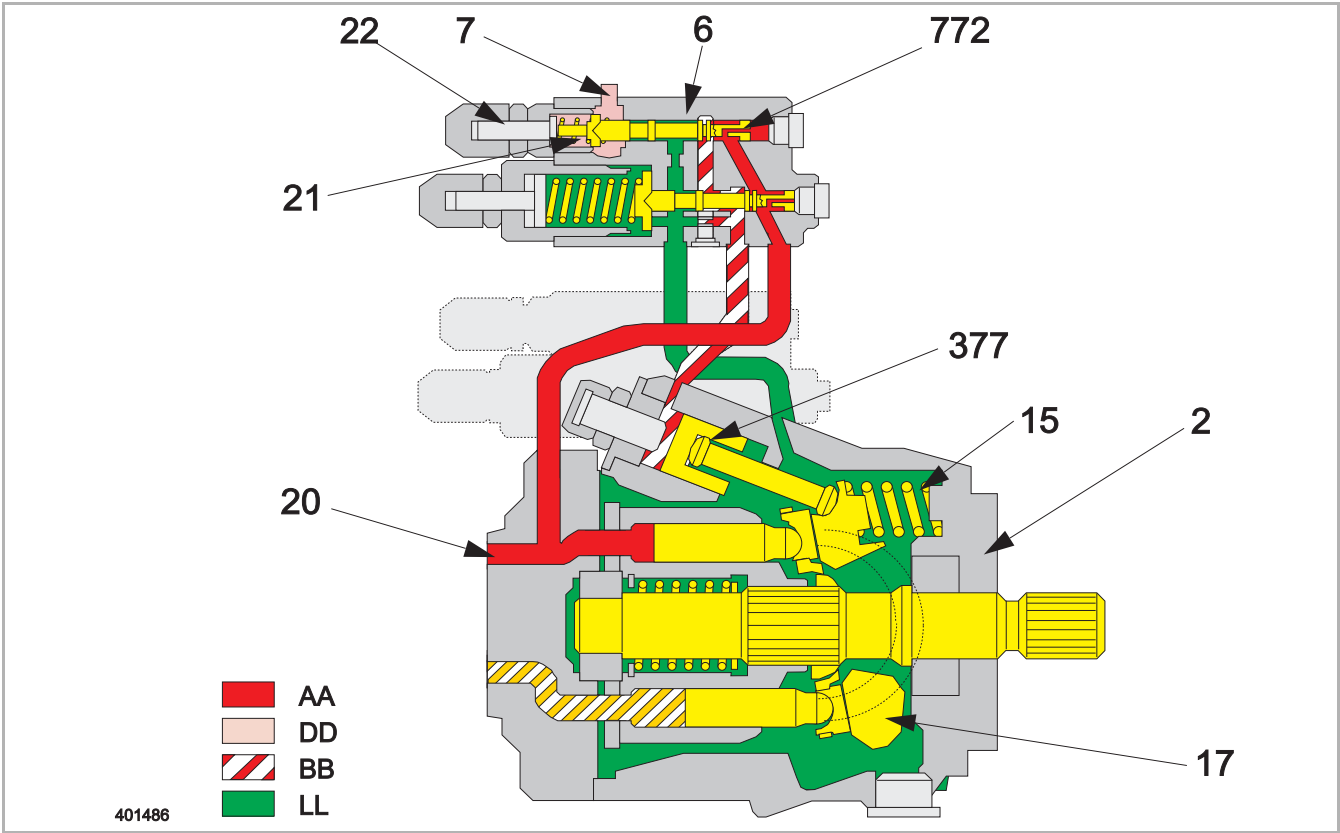
Pump starts pumping



Item	Component
2	(PFC) pump
6	Compensating valve
7	Input (load pressure from signal network)
14	Control piston
15	Control spring
17	Swash plate
20	Pump outlet
21	Compression spring (margin pressure)
25	Control edge
377	Variable-displacement pump hydraulic cylinder
772	Volume flow controller
-	-
AA	Oil supply
BB	Pressure-reduced oil
DD	Control oil
LL	Tank (pressureless)

Description of function	When a control unit is actuated, a load pressure builds up in the LS line. In this process, the following conditions result at the volume flow controller (772): – the pump pressure acts on the right face end – the load pressure and the spring force of the compression spring (margin pressure) (21) act in the spring space. – Since the load pressure + the spring force of the compression spring (margin pressure) (21) is higher than the pump pressure on the right face end, the volume flow controller is moved to the right. This : – shuts off the passage of the pump pressure to the variable-displacement pump hydraulic cylinder (377); – connects the variable-displacement pump hydraulic cylinder (377) with the tank (no pressure on top side of ram) – makes the control spring (15) swing out the swash plate (17). The pump now feeds a higher volume flow. This process is referred to as "Upstroking". The volume flow of the pump is determined by the restrictor effect of the open spool cross-section or by the setting of a control unit.
Lower volume flow requirement:	When the spool cross-section is reduced (the volume flow is to be reduced), the load pressure at the input (7) drops. This changes the force ratio at the volume flow controller (772), actuating the volume flow controller to the left according to the pressure drop, against the compression spring. The variable-displacement pump hydraulic cylinder (377) is subject to pressure and the swash plate (17) is set to a flatter position, and the pump performs a downstroke until the volume flow requirement is met.
Higher volume flow requirement.	An example: A control unit has been actuated. The load pressure is 140 bar, the pump pressure now goes to (160 bar). (Load pressure 140 bar + 20 bar margin pressure). When another control unit with a load pressure of 100 bar is actuated now, the pump pressure drops slightly. This also decreases the pressure on the top face of the variable-displacement pump hydraulic cylinder (377) accordingly, the swash plate (17) is moved to a steeper position, increasing the volume flow until the additional volume flow requirement of the second circuit has been met and the pump pressure of 160 bar has been re-established. The load pressure on the controller remains stable at 140 bar.

Constant volume flow



Item	Component
2	(PFC) Pump
6	Compensating valve
7	Input (load pressure from signal network)
14	Control piston
15	Control spring
17	Swash plate
20	Pump outlet
21	Compression spring (margin pressure)
22	Setscrew
25	Control edge
377	Variable-displacement pump hydraulic cylinder
772	Volume flow controller
-	-
AA	Oil supply
BB	Pressure-reduced oil
DD	Control oil
LL	Tank (pressureless)

Description of function

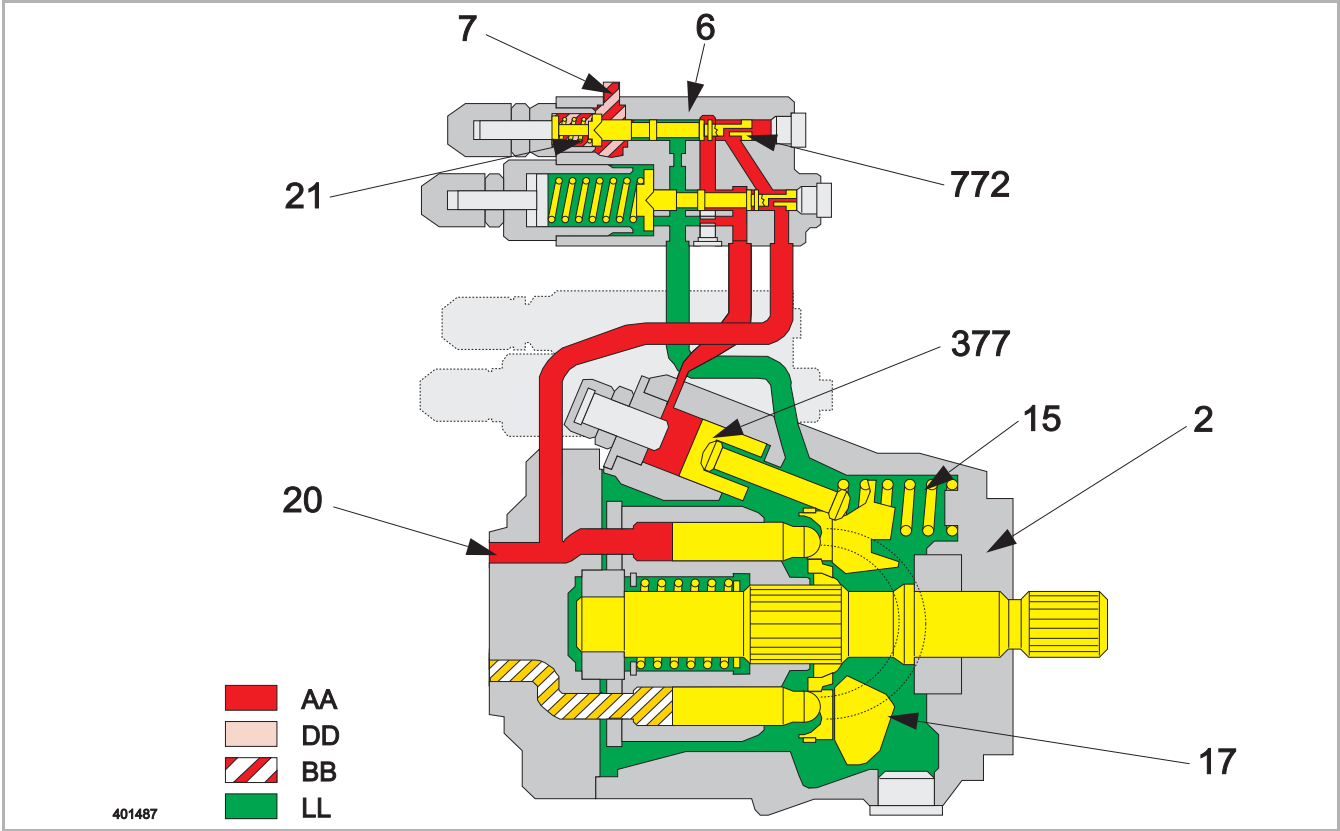
When operating a consumer with a constant load (e.g. a hydraulic motor), the volume flow controller (772) is actuated to a stable position. This keeps both the pressure on the top face of the variable-displacement pump hydraulic cylinder (377) and the position of the swash plate (17) constant. As long as the position of the swash plate (17) remains unchanged, the pump pumps a constant volume flow.

The following pressures now result on the volume flow controller (772):

- Load pressure (signal) + spring force of the compression spring (margin pressure) (21) on the left side.
- Pump pressure on the right side.

The differential pressure is the margin pressure corresponding to the spring force of the compression spring (21). The margin pressure is to be 20 bar and may be adjusted using set screw (22).

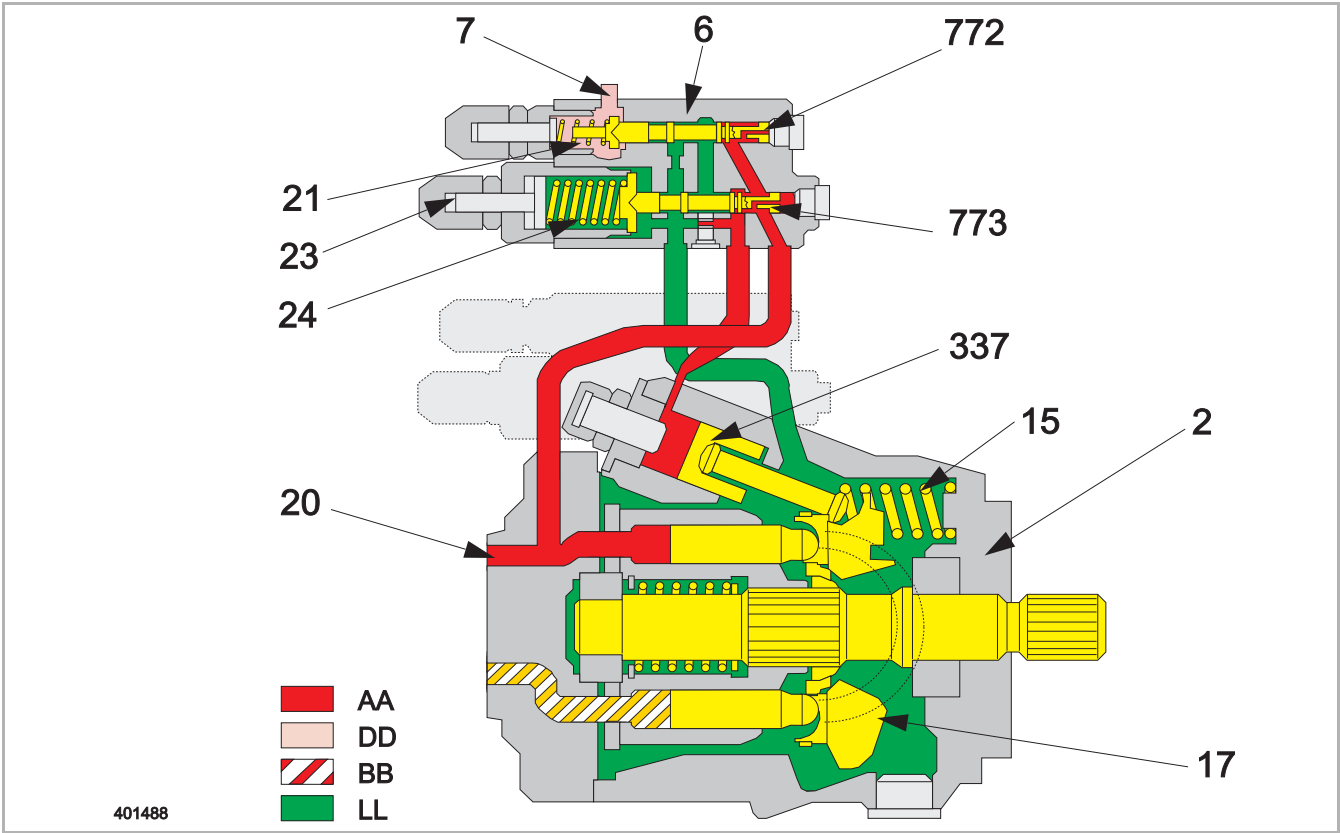
Downstroking the PFC pump



Item	Component
2	(PFC) Pump
6	Compensating valve
7	Input (load pressure from signal network)
14	Control piston
15	Control spring
17	Swash plate
20	Pump outlet
21	Compression spring (margin pressure)
22	Setscrew
25	Control edge
377	Variable-displacement pump hydraulic cylinder
772	Volume flow controller
-	-
AA	Oil supply
BB	Pressure-reduced oil
DD	Control oil
LL	Tank (pressureless)

Description of function	Downstroking of the PFC pump is performed under the following conditions: – a control unit is actuated to neutral position, no volume flow is required. – an additional control unit is actuated into the fine control range, a very small volume flow is required. – in parallel operation, a control unit is actuated to the neutral position or to the fine control range. A smaller volume flow is required. The pump must perform a downstroke whenever a smaller volume flow is needed. The downstroking process is started when the pressure on the right face end of the volume flow controller (772) is higher than on the left face (in the spring space). In this case, the volume flow controller (772) is moved to the left against the compression spring (21), in this process opening the control edge (25). This results in a rising pressure on the top face of the variable-displacement pump hydraulic cylinder (377) that sets the swash plate (17) to a flatter position against the control spring (15) – the volume flow is reduced. When a control unit is actuated in the fine control range (a very small volume flow is to flow to the consumer), the load pressure at input (7) drops. This changes the force ratio at the volume flow controller (772) so that it is actuated to the left according to the pressure drop, against the compression spring. The control edge (25) is opened, thus subjecting the variable-displacement pump hydraulic cylinder (377) to pressure. The swash plate (17) is set to a flatter position and the pump performs a downstroke until the volume flow requirement is met.
Parallel operation of two control units	When operating two control units in parallel, the load pressure values are 140 bar and 100 bar. In this process, the pump pressure adjusts to 170 bar. (Load pressure 140 bar + 20 bar margin pressure). Both the volume flow controller (772) and the swash plate (17) are in a constant position. The pump provides the volume flow required for both consumers. When the second control unit (load pressure 100 bar) is now actuated in the neutral position, the volume flow must decrease since only the first hydraulic circuit remains to be supplied. This is achieved by increasing the pump pressure for a short time following the shut-down of a hydraulic circuit, since the high volume flow flows to the first control unit only. The volume flow controller (772) is now actuated to the left, the control edge (25) opens and the pressure on the top face of the control ram rises. The swash plate (17) is set to a flatter position, thus reducing the volume flow.

Maximum pressure limitation (pressure relief valve function), maximum standby pressure



Item	Component
2	(PFC) Pump
6	Compensating valve
7	Input (load pressure from signal network)
15	Control spring
17	Swash plate
20	Pump outlet
21	Compression spring (margin pressure)
22	Setscrew
26	Control edge
377	Variable-displacement pump hydraulic cylinder
772	Volume flow controller
773	Pressure controller
-	-
AA	Oil supply
BB	Pressure-reduced oil
DD	Control oil
LL	Tank (pressureless)

Description of function

The pressure in the hydraulic system is limited to 200 ± 5 bar in order to prevent component damage. This function is ensured by pressure controller (773). During normal operation (working pressure < max. pressure), the pressure controller (773) is pushed to the right by compression spring (24). Under such pressure conditions:

- the volume flow controller (772) is pushed to the right by compression spring (21).
- the pressure controller (773) is pushed to the left against compression spring (24).

This movement occurs at a pressure of 200 ± 5 bar. The control edge (26) is now opened, enabling the pump pressure to act upon the top face of the variable-displacement pump hydraulic cylinder (377). The swash plate (17) is now actuated towards "Min. pump capacity" against the control spring (15). This takes 8 – 10 milliseconds. The PFC pump now pumps the smallest volume flow against the maximum pressure of 200 ± 5 bar. The max. pressure can be set using the set screw (23). The hydraulic system remains at the max. pressure level until the control unit is actuated in neutral position or until the load on the LS line is relieved at input (7).

2 Steering hydraulics

System concept

Description

The vehicle is equipped with an EHL steering system.

EHL is the German abbreviation of "Electro-hydraulic steering".

The electro-hydraulic steering system EHL is an electro-hydraulically controlled, intelligent automatic steering system for the rigid axle (2). The floating axle (1) located at the front in direction of travel is steered manually by the steering wheel as usual. When Autopilot steering is activated, sensors ensure the automatic steering of the floating axle (1) along the crop edge. The rigid axle (2) located at the rear in direction of travel is steered automatically as a function of the current steering angle of the front axle and of the selected steering strategy. If required, the "Ground speed control lever" steering strategy also enables manual steering of the rigid axle (2) independently of the front axle. Both axles may be steered in order to increase vehicle manoeuvrability.

There is a differentiation between the emergency steering and Orbitrol steering of rigid axle (2) or floating axle (1) operating modes. When using the Orbitrol steering, the floating axle (1) is steered entirely by hydraulic means. This axle is steered by electro-hydraulic means, but cannot be influenced. At high vehicle speeds (road travel) the rigid axle (2) is tracked in the straight ahead position.

Definition of axles

The floating axle (1) is always located below the engine, regardless of the cab position.



1 = Floating axle 2 = Rigid axle



1 = Floating axle 2 = Rigid axle

Fully automatic steering operation. Special steering programs

In the special steering programs (e.g. Autopilot, crab steer mode), the front and the rear axle are steered by electro-hydraulic means. These special steering programs are available only for fieldwork. Transmission of the steering commands is fully electronic.

Emergency steering safety concept

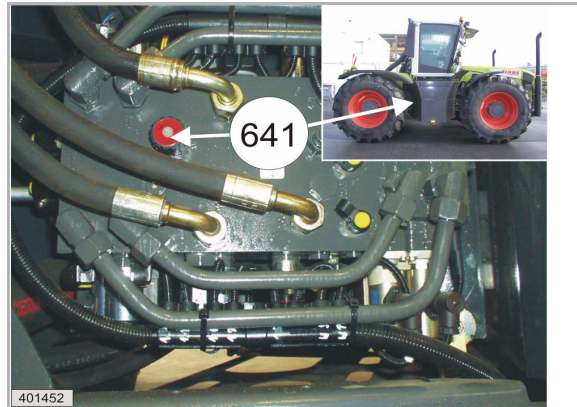
In case of disturbances, the steered axles are brought to a "safe condition". A "safe condition" is defined as both axles being steered simultaneously and by purely hydraulic means, using the Orbitrol (steering wheel). To achieve this, the steering cylinders of the floating axle and of the rigid axle are connected in series, using the definition valves. The oil supply is ensured by the wheel-driven emergency steering pump (245). The steering angles of the floating axle and of the rigid axle are identical, but have their senses reversed.

Adjusting the straight-line stability of the rigid axle (2).

When "Emergency steering operation" is started, the current wheel position of the rigid axle (2) is adopted. Straight-line stability may not be provided.

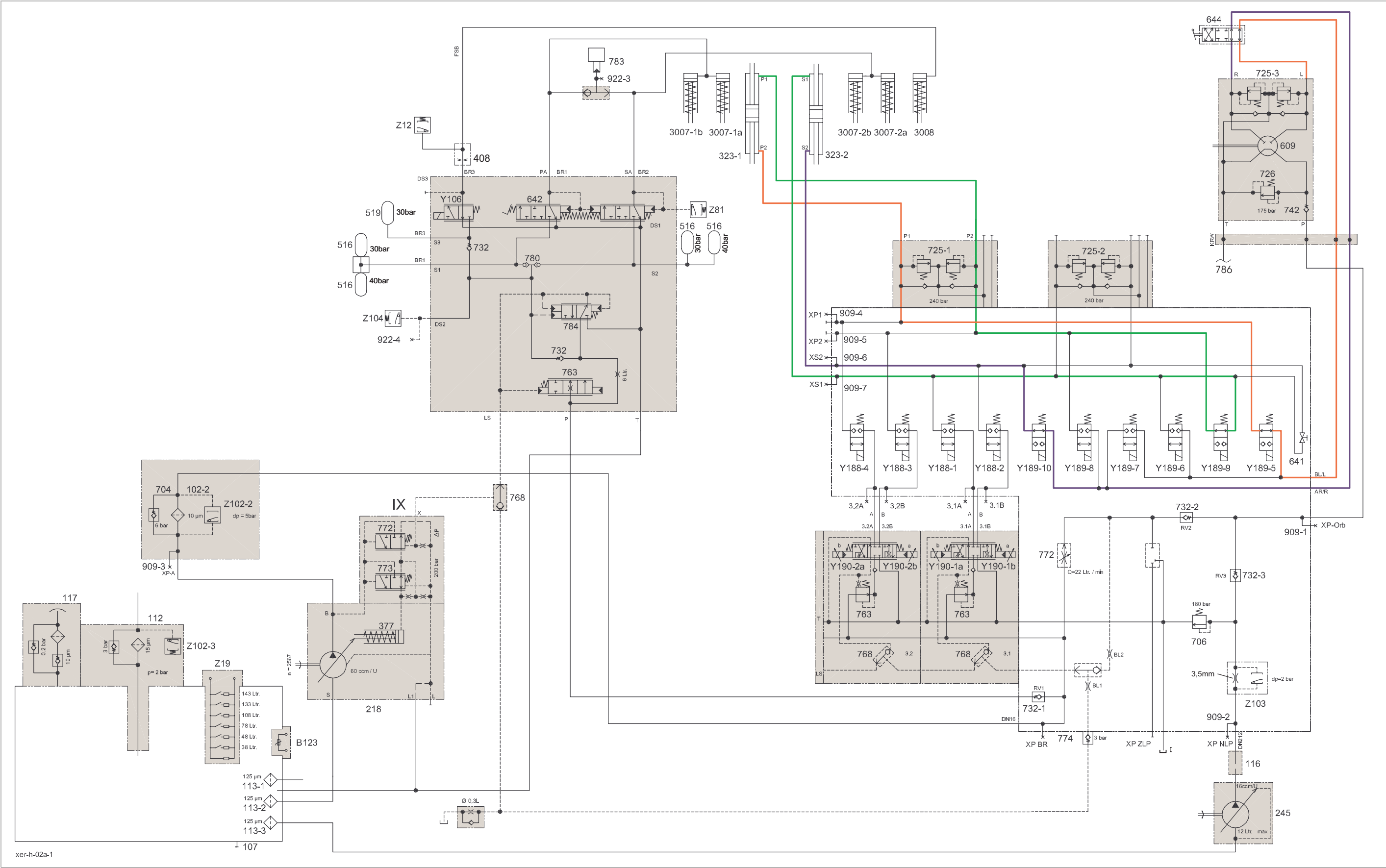
In this case:

- Open the shut-off valve (641)
- Set the rigid axle (2) to straight-line travel, using the steering wheel
- Close the shut-off valve (641) again.



Fully hydraulic steering (Emergency steering)

Circuit diagram



Key to diagram

Item	Component
I	Main valve block
IX	Steering / brake hydraulics pump
-	-
102	Pressure filter
107	Oil drain
112	Return filter
113	Suction filter
116	Resonance tube (Silencer)
117	Fresh air filter element
-	-
218	Steering hydraulics pump
245	Emergency steering pump
-	-
323-1	Floating axle steering hydraulic cylinder
323-2	Rigid axle steering hydraulic cylinder
377	Variable-displacement pump hydraulic cylinder
-	-
408	Orifice plate Ø 0.8 mm
-	-
516	Service brake pressure accumulator
-	-
609	Orbitrol steering system rotary valve
641	Shut-off valve
642	Service brake valve
644	Steering sense valve
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
725	Steering double shock valve
726	Steering pressure relief valve
732	Non-return valve
742	Steering safety valve
763	Input pressure balance
772	Volume flow controller

Item	Component
772	Volume flow controller
773	Pressure controller
773	Pressure controller
774	Pressurizing valve
780	Shuttle valve
783	Trailer brake valve
786	LS signal shuttle valve
-	-
909-1	Steering hydraulics Orbitrol measuring point
909-2	Steering hydraulics emergency steering pump measuring point
909-4	Steering hydraulics steering cylinder XS1 measuring point
909-5	Steering hydraulics steering cylinder XS2 measuring point
909-6	Steering hydraulics steering cylinder XP2 measuring point
909-7	Steering hydraulics steering cylinder XP1 measuring point
922	Measuring point
-	-
3007	Service brake hydraulic cylinder
3008	Parking brake hydraulic cylinder
-	-
B123	Hydraulic oil temperature sensor
-	-
Y106	Parking brake solenoid coil
Y188-1	Steering logics shut-off valve solenoid coil
Y188-2	Steering logics shut-off valve solenoid coil
Y188-3	Steering logics shut-off valve solenoid coil
Y188-4	Steering logics shut-off valve solenoid coil
Y189-10	Steering logics definition valve solenoid coil
Y189-5	Steering logics definition valve solenoid coil
Y189-6	Steering logics definition valve solenoid coil
Y189-7	Steering logics definition valve solenoid coil
Y189-8	Steering logics definition valve solenoid coil
Y189-9	Steering logics definition valve solenoid coil
Y190-1a	Automatic steering solenoid coil
Y190-1b	Automatic steering solenoid coil
Y190-2a	Automatic steering solenoid coil
Y190-2b	Automatic steering solenoid coil

Item	Component
Z19	Hydraulic oil level (min.)
Z81	Service brake pressure actual value switch
Z102	Filter bypass actual value switch (bypass open)
Z103	Pump function actual value switch
Z104	Brake accumulator pressure actual value switch

Orbitrol axle = Floating axle (1), the rigid axle (2) is tracked by electro-hydraulic means

Orbitrol axle = Floating axle (1), the rigid axle (2) is tracked by electro-hydraulic means

Key to diagram

Item	Component
I	Main valve block
IX	Steering / brake hydraulics pump
-	-
102	Pressure filter
107	Oil drain
112	Return filter
113	Suction filter
116	Resonance tube (Silencer)
117	Fresh air filter element
-	-
218	Steering hydraulics pump
245	Emergency steering pump
323-1	Floating axle steering hydraulic cylinder
323-2	Rigid axle steering hydraulic cylinder
377	Variable-displacement pump hydraulic cylinder
-	-
406	Orifice plate
-	-
516	Service brake pressure accumulator
-	-
609	Orbitrol steering system rotary valve
641	Shut-off valve
642	Service brake valve
644	Steering sense valve
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
725	Steering double shock valve
726	Steering pressure relief valve
732	Non-return valve
742	Steering safety valve
763	Input pressure balance
772	Volume flow controller

Orbitrol axle = Floating axle (1), the rigid axle (2) is tracked by electro-hydraulic means

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Item	Component
772	Volume flow controller
773	Pressure controller
773	Pressure controller
774	Pressurizing valve
780	Shuttle valve
783	Trailer brake valve
786	LS signal shuttle valve
-	-
909-1	Steering hydraulics Orbitrol measuring point
909-2	Steering hydraulics emergency steering pump measuring point
909-4	Steering hydraulics steering cylinder XS1 measuring point
909-5	Steering hydraulics steering cylinder XS2 measuring point
909-6	Steering hydraulics steering cylinder XP2 measuring point
909-7	Steering hydraulics steering cylinder XP1 measuring point
-	-
3007	Service brake hydraulic cylinder
3008	Parking brake hydraulic cylinder
-	-
B123	Hydraulic oil temperature sensor
-	-
Y106	Parking brake solenoid coil
Y188-1	Steering logics shut-off valve solenoid coil
Y188-2	Steering logics shut-off valve solenoid coil
Y188-3	Steering logics shut-off valve solenoid coil
Y188-4	Steering logics shut-off valve solenoid coil
Y189-10	Steering logics definition valve solenoid coil
Y189-5	Steering logics definition valve solenoid coil
Y189-6	Steering logics definition valve solenoid coil
Y189-7	Steering logics definition valve solenoid coil
Y189-8	Steering logics definition valve solenoid coil
Y189-9	Steering logics definition valve solenoid coil
Y190-1a	Automatic steering solenoid coil
Y190-1b	Automatic steering solenoid coil
Y190-2a	Automatic steering solenoid coil
Y190-2b	Automatic steering solenoid coil
Z19	Hydraulic oil level (min.)

Item	Component
Z81	Service brake pressure actual value switch
Z102	Filter bypass actual value switch (bypass open)
Z103	Pump function actual value switch
Z104	Brake accumulator pressure actual value switch

Orbitrol axle = Rigid axle (2), the floating axle (1) is tracked by electro-hydraulic means

Key to diagram

Item	Component
I	Main valve block
IX	Steering / brake hydraulics pump
-	-
102	Pressure filter
107	Oil drain
112	Return filter
113	Suction filter
116	Resonance tube (Silencer)
117	Fresh air filter element
-	-
218	Steering hydraulics pump
245	Emergency steering pump
-	-
323-1	Floating axle steering hydraulic cylinder
323-2	Rigid axle steering hydraulic cylinder
377	Variable-displacement pump hydraulic cylinder
-	-
408	Orifice plate Ø 0.8 mm
-	-
516	Service brake pressure accumulator
-	-
609	Orbitrol steering system rotary valve
641	Shut-off valve
642	Service brake valve
644	Steering sense valve
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
725	Steering double shock valve
726	Steering pressure relief valve
732	Non-return valve
742	Steering safety valve
763	Input pressure balance
772	Volume flow controller

Orbitrol axle = Rigid axle (2), the floating axle (1) is tracked by electro-hydraulic means

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Item	Component
772	Volume flow controller
773	Pressure controller
773	Pressure controller
774	Pressurizing valve
780	Shuttle valve
783	Trailer brake valve
786	LS signal shuttle valve
-	-
909-1	Steering hydraulics Orbitrol measuring point
909-2	Steering hydraulics emergency steering pump measuring point
909-4	Steering hydraulics steering cylinder XS1 measuring point
909-5	Steering hydraulics steering cylinder XS2 measuring point
909-6	Steering hydraulics steering cylinder XP2 measuring point
909-7	Steering hydraulics steering cylinder XP1 measuring point
922	Measuring point
-	-
3007	Service brake hydraulic cylinder
3008	Parking brake hydraulic cylinder
-	-
B123	Hydraulic oil temperature sensor
-	-
Y106	Parking brake solenoid coil
Y188-1	Steering logics shut-off valve solenoid coil
Y188-2	Steering logics shut-off valve solenoid coil
Y188-3	Steering logics shut-off valve solenoid coil
Y188-4	Steering logics shut-off valve solenoid coil
Y189-10	Steering logics definition valve solenoid coil
Y189-5	Steering logics definition valve solenoid coil
Y189-6	Steering logics definition valve solenoid coil
Y189-7	Steering logics definition valve solenoid coil
Y189-8	Steering logics definition valve solenoid coil
Y189-9	Steering logics definition valve solenoid coil
Y190-1a	Automatic steering solenoid coil
Y190-1b	Automatic steering solenoid coil
Y190-2a	Automatic steering solenoid coil
Y190-2b	Automatic steering solenoid coil

Item	Component
Z19	Hydraulic oil level (min.)
Z81	Service brake pressure actual value switch
Z102	Filter bypass actual value switch (bypass open)
Z103	Pump function actual value switch
Z104	Brake accumulator pressure actual value switch

The floating axle (1) and the rigid axle (2) are steered electro-hydraulically – the Orbitrol steering circuit is closed.

Key to diagram

Item	Component
I	Main valve block
IX	Steering / brake hydraulics pump
-	-
102	Pressure filter
107	Oil drain
112	Return filter
113	Suction filter
116	Resonance tube (Silencer)
117	Fresh air filter element
-	-
218	Steering hydraulics pump
245	Emergency steering pump
-	-
323-1	Floating axle steering hydraulic cylinder
323-2	Rigid axle steering hydraulic cylinder
377	Variable-displacement pump hydraulic cylinder
-	-
408	Orifice plate Ø 0.8 mm
-	-
516	Service brake pressure accumulator
-	-
609	Orbitrol steering system rotary valve
641	Shut-off valve
642	Service brake valve
644	Steering sense valve
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
725	Steering double shock valve
726	Steering pressure relief valve
732	Non-return valve
742	Steering safety valve
763	Input pressure balance
772	Volume flow controller

The floating axle (1) and the rigid axle (2) are steered electro-hydraulically – the Orbitrol steering circuit is closed.

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Item	Component
772	Volume flow controller
773	Pressure controller
773	Pressure controller
774	Pressurizing valve
780	Shuttle valve
783	Trailer brake valve
786	LS signal shuttle valve
-	-
909-1	Steering hydraulics Orbitrol measuring point
909-2	Steering hydraulics emergency steering pump measuring point
909-4	Steering hydraulics steering cylinder XS1 measuring point
909-5	Steering hydraulics steering cylinder XS2 measuring point
909-6	Steering hydraulics steering cylinder XP2 measuring point
909-7	Steering hydraulics steering cylinder XP1 measuring point
922	Measuring point
-	-
3007	Service brake hydraulic cylinder
3008	Parking brake hydraulic cylinder
-	-
B123	Hydraulic oil temperature sensor
-	-
Y106	Parking brake solenoid coil
Y188-1	Steering logics shut-off valve solenoid coil
Y188-2	Steering logics shut-off valve solenoid coil
Y188-3	Steering logics shut-off valve solenoid coil
Y188-4	Steering logics shut-off valve solenoid coil
Y189-10	Steering logics definition valve solenoid coil
Y189-5	Steering logics definition valve solenoid coil
Y189-6	Steering logics definition valve solenoid coil
Y189-7	Steering logics definition valve solenoid coil
Y189-8	Steering logics definition valve solenoid coil
Y189-9	Steering logics definition valve solenoid coil
Y190-1a	Automatic steering solenoid coil
Y190-1b	Automatic steering solenoid coil
Y190-2a	Automatic steering solenoid coil
Y190-2b	Automatic steering solenoid coil

The floating axle (1) and the rigid axle (2) are steered electro-hydraulically – the Orbitrol steering circuit is closed.

402

Item	Component
Z19	Hydraulic oil level (min.)
Z81	Service brake pressure actual value switch
Z102	Filter bypass actual value switch (bypass open)
Z103	Pump function actual value switch
Z104	Brake accumulator pressure actual value switch

Steering valve VI

The technical drawing illustrates the 400995 hydraulic manifold, providing a comprehensive view of its components and internal circuitry.

Isometric Views:

- Top View:** Shows the manifold's top surface with various ports and components labeled, including Y190-1a, 909-2(XP-NLP), BL/L 3.2A, 3.1A, Y190-2a, 3.2A, P-Orb, 772, 641(1.11), 909-7(P1), 3.2B, 3.1B, 909-6(P2), 3.1A, 3.1B, 3.1, Y188-2(DV2), Y188-3(DV3), Y188-9(DV9), Y188-10(DV10), Y188-8(DV8), 706, LS, AR/R, Y190-1b, Y190-2b, 3.2B, and 641.
- Bottom View:** Shows the manifold's bottom surface with components labeled, including BR, T, 725-2, 19.0, S2, S1, NLP, VP, 909-3(XP-BR), 909-5(S2), P2, 909-4(XP1), P1, Y188-4(DV4), Y188-1(DV1), ZLP, Z103, Y189-6(DV6), Y189-5(DV5), XP-ZLP, Y189-7(DV7), and 725-1.

Schematic Diagram:

The schematic diagram details the internal hydraulic circuit, showing the flow paths between various components and ports. Key elements include:

- Ports:** XP1, XP2, XS2, XS1, 909-4, 909-5, 909-6, 909-7, 909-1, 909-2, 909-3, 909-4, 909-5, 909-6, 909-7, 909-8, 909-9, 909-10, 909-11, 909-12, 909-13, 909-14, 909-15, 909-16, 909-17, 909-18, 909-19, 909-20, 909-21, 909-22, 909-23, 909-24, 909-25, 909-26, 909-27, 909-28, 909-29, 909-30, 909-31, 909-32, 909-33, 909-34, 909-35, 909-36, 909-37, 909-38, 909-39, 909-40, 909-41, 909-42, 909-43, 909-44, 909-45, 909-46, 909-47, 909-48, 909-49, 909-50, 909-51, 909-52, 909-53, 909-54, 909-55, 909-56, 909-57, 909-58, 909-59, 909-60, 909-61, 909-62, 909-63, 909-64, 909-65, 909-66, 909-67, 909-68, 909-69, 909-70, 909-71, 909-72, 909-73, 909-74, 909-75, 909-76, 909-77, 909-78, 909-79, 909-80, 909-81, 909-82, 909-83, 909-84, 909-85, 909-86, 909-87, 909-88, 909-89, 909-90, 909-91, 909-92, 909-93, 909-94, 909-95, 909-96, 909-97, 909-98, 909-99, 909-100.
- Components:** 725-1, 725-2, 725-3, 725-4, 725-5, 725-6, 725-7, 725-8, 725-9, 725-10, 725-11, 725-12, 725-13, 725-14, 725-15, 725-16, 725-17, 725-18, 725-19, 725-20, 725-21, 725-22, 725-23, 725-24, 725-25, 725-26, 725-27, 725-28, 725-29, 725-30, 725-31, 725-32, 725-33, 725-34, 725-35, 725-36, 725-37, 725-38, 725-39, 725-40, 725-41, 725-42, 725-43, 725-44, 725-45, 725-46, 725-47, 725-48, 725-49, 725-50, 725-51, 725-52, 725-53, 725-54, 725-55, 725-56, 725-57, 725-58, 725-59, 725-60, 725-61, 725-62, 725-63, 725-64, 725-65, 725-66, 725-67, 725-68, 725-69, 725-70, 725-71, 725-72, 725-73, 725-74, 725-75, 725-76, 725-77, 725-78, 725-79, 725-80, 725-81, 725-82, 725-83, 725-84, 725-85, 725-86, 725-87, 725-88, 725-89, 725-90, 725-91, 725-92, 725-93, 725-94, 725-95, 725-96, 725-97, 725-98, 725-99, 725-100.
- Flow Paths:** The diagram shows the flow paths between the manifold and the actuators, including the flow from the pump to the actuators and the return flow to the tank.

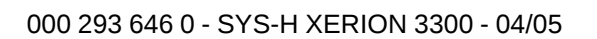
Key to diagram

Item	Component
VI	Steering valve
-	-
116	Resonance tube (Silencer)
-	-
245	Emergency steering pump
-	-
641	Shut-off valve
-	-
706	Pressure relief valve
725	Steering double shock valve
726	Steering pressure relief valve
732	Non-return valve
763	Input pressure balance
768	LS signal shuttle valve
772	Volume flow controller
774	Pressurizing valve
-	-
909-1	Steering hydraulics Orbitrol measuring point
909-2	Steering hydraulics emergency steering pump measuring point
909-3	Steering hydraulics system pressure (steering/brake) measuring point
909-4	Steering hydraulics steering cylinder XS1 measuring point
909-5	Steering hydraulics steering cylinder XS2 measuring point
909-6	Steering hydraulics steering cylinder XP2 measuring point
909-7	Steering hydraulics steering cylinder XP1 measuring point
-	-
Y188-1	Steering logics shut-off valve solenoid coil
Y188-2	Steering logics shut-off valve solenoid coil
Y188-3	Steering logics shut-off valve solenoid coil
Y188-4	Steering logics shut-off valve solenoid coil
Y189-5	Steering logics definition valve solenoid coil
Y189-6	Steering logics definition valve solenoid coil
Y189-7	Steering logics definition valve solenoid coil
Y189-8	Steering logics definition valve solenoid coil
Y189-9	Steering logics definition valve solenoid coil

Item	Component
Y189-10	Steering logics definition valve solenoid coil
Y190-1a	Automatic steering solenoid coil
Y190-1b	Automatic steering solenoid coil
Y190-2a	Automatic steering solenoid coil
Y190-2b	Automatic steering solenoid coil

3 Working hydraulics

Working hydraulics circuit diagram



Key to diagram

Item	Component
I	Main valve block
-	-
102-1	Working hydraulics pressure filter
-	-
515	Pressure accumulator
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
768	LS signal shuttle valve
772-1a	Volume flow controller (red A)
772-1b	Volume flow controller (red B)
772-2a	Volume flow controller (EHR A)
772-2b	Volume flow controller (EHR B)
772-3a	Volume flow controller (white A)
772-3b	Volume flow controller (white B)
772-4a	Volume flow controller (yellow A)
772-4b	Volume flow controller (yellow B)
772-5a	Volume flow controller (green A)
772-5b	Volume flow controller (green B)
772-6a	Volume flow controller (swing lower link A)
772-6b	Volume flow controller (swing lower link B)
787	Pressure balance
-	-
901	Working hydraulics measuring point
-	-
Y121	Shifting aid, reverse
Y192	Floating axle locking solenoid valve
Y193	Floating axle unlocking solenoid valve
Y198-1a	Pilot valve (red A)
Y198-1b	Pilot valve (red B)
Y198-2a	Pilot valve (EHR A)
Y198-2b	Pilot valve (EHR B)
Y198-3a	Pilot valve (white A)
Y198-3b	Pilot valve (white B)

Item	Component
Y198-4a	Pilot valve (yellow A)
Y198-4b	Pilot valve (yellow B)
Y198-5a	Pilot valve (green A)
Y198-5b	Pilot valve (green B)
Y198-6a	Pilot valve (blue A)
Y198-6b	Pilot valve (blue B)
-	-
Z102-1	Working hydraulics filter bypass actual value switch (bypass open)
Z105-1	Floating axle lock 55 bar pressure
Z105-2	Floating axle lock 115 bar pressure

Main valve block

The technical drawing illustrates the 401003 hydraulic system, which is a 220bar system. It includes a 3D perspective view, a 2D exploded view, and a 2D schematic diagram.

3D Perspective View: Shows the main hydraulic unit with various ports and components labeled. Key components include:

- XP-L**: Main hydraulic unit.
- XP-A**: Auxiliary hydraulic unit.
- 515 (40 bar)** and **515 (80 bar)**: Pressure vessels.
- Z102-1** and **Z102-2**: Zeta valves.
- 901 (XP-A)**: Pressure sensor.
- 909-3 (XP-L)**: Pressure sensor.
- 706**: Check valve.
- XP-PA**: Pressure-activated valve.
- Y192**, **Y121**, **Y193**: Solenoid valves.
- Z105-1** and **Z105-2**: Zeta valves.
- LS**: Locking solenoid.
- XP-T-Orb**: Orbital valve.
- 924 (XP-LS)** and **924 (XP-T)**: Pressure sensors.
- 785** and **421**: Check valves.

2D Exploded View: Shows the main hydraulic unit with its various ports and components labeled. Key components include:

- 515 (40 bar)** and **515 (80 bar)**: Pressure vessels.
- Z102-1** and **Z102-2**: Zeta valves.
- 901 (XP-A)**: Pressure sensor.
- 909-3 (XP-L)**: Pressure sensor.
- 706**: Check valve.
- XP-PA**: Pressure-activated valve.
- Y192**, **Y121**, **Y193**: Solenoid valves.
- Z105-1** and **Z105-2**: Zeta valves.
- LS**: Locking solenoid.
- XP-T-Orb**: Orbital valve.
- 924 (XP-LS)** and **924 (XP-T)**: Pressure sensors.
- 785** and **421**: Check valves.

2D Schematic Diagram: Shows the hydraulic circuit with various components and their connections. Key components include:

- 220bar**: Main system pressure.
- 50bar**: Auxiliary system pressure.
- 706**: Check valve.
- 772-1a** to **772-6b**: Solenoid valves.
- Y198-1a** to **Y198-6b**: Solenoid valves.
- 787**: Check valve.
- 704**: Check valve.
- 102-1** and **102-2**: Zeta valves.
- Z102-1** and **Z102-2**: Zeta valves.
- dp=5bar**: Pressure differential.
- 901 X XP-A** and **909-3 X XP-L**: Pressure sensors.
- DN 20 SAE 1"**: Port size.
- 768**: Check valve.
- SAE 3/4"**: Port size.

Key to diagram

Item	Component
I	Main valve block
-	-
102-1	Working hydraulics pressure filter
-	-
515	Pressure accumulator
-	-
704	Bypass valve (non-return valve)
706	Pressure relief valve
768	LS signal shuttle valve
772-1a	Volume flow controller (red A)
772-1b	Volume flow controller (red B)
772-2a	Volume flow controller (EHR A)
772-2b	Volume flow controller (EHR B)
772-3a	Volume flow controller (white A)
772-3b	Volume flow controller (white B)
772-4a	Volume flow controller (yellow A)
772-4b	Volume flow controller (yellow B)
772-5a	Volume flow controller (green A)
772-5b	Volume flow controller (green B)
772-6a	Volume flow controller (swing lower link A)
772-6b	Volume flow controller (swing lower link B)
787	Pressure balance
-	-
901	Working hydraulics measuring point
924	LS pressure measuring point
-	-
Y121	Shifting aid, reverse
Y192	Floating axle locking solenoid valve
Y193	Floating axle unlocking solenoid valve
Y198-1a	Pilot valve (red A)
Y198-1b	Pilot valve (red B)
Y198-2a	Pilot valve (EHR A)
Y198-2b	Pilot valve (EHR B)
Y198-3a	Pilot valve (white A)

Item	Component
Y198-3b	Pilot valve (white B)
Y198-4a	Pilot valve (yellow A)
Y198-4b	Pilot valve (yellow B)
Y198-5a	Pilot valve (green A)
Y198-5b	Pilot valve (green B)
Y198-6a	Pilot valve (blue A)
Y198-6b	Pilot valve (blue B)
-	-
Z102-1	Working hydraulics filter bypass actual value switch (bypass open)
Z105-1	Floating axle lock 55 bar pressure
Z105-2	Floating axle lock 115 bar pressure

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